United States Patent

[11] 3,581,516

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[45] Patented **June 1, 1971**
[73] Assignee **Whirlpool Corporation**

[54] ICE BODY MAKER COLLECTING BIN CONTROL

14 Claims, 19 Drawing Figs.

[52] **U.S. Cl.** **62/137,** 200/61.2, 222/56
[51] **Int. Cl.** **F25c 5/18**
[50] **Field of Search** 62/137, 344; 200/61.2; 222/56

[56] **References Cited**

UNITED STATES PATENTS

2,778,198	1/1957	Heath	62/137
2,077,820	4/1937	Arp	62/344X
3,407,619	10/1968	Walker	62/137

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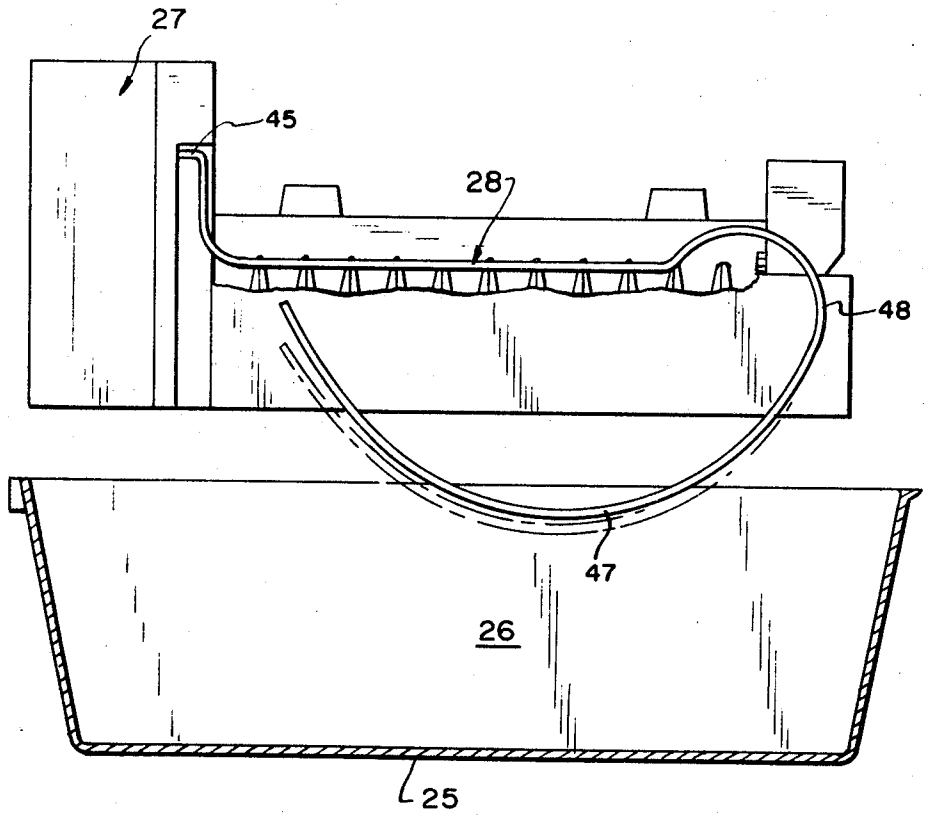
ABSTRACT: An ice body maker having a mold in which ice bodies are formed with means for ejecting the ice bodies to a collecting bin along a preselected path. A control is provided including a holding means which interrupts the movement of the ice bodies along the ejection path to hold them in spaced relationship to the collecting space, permitting them to dry. During this drying period a sensing portion of the control moves through the collecting space to sense the level of ice bodies therein for automatically maintaining a preset level. During movement of the sensing portion of the control through the collecting space, the holding means prevents the ice bodies being ejected from the mold from falling onto the sensing portion, thereby preventing them from being raked from the bin defining the collecting space by the sensing portion should the bin be removed from the ice body maker. The control is adjustable to permit different preset levels of ice bodies in the collecting space to be obtained as desired. The adjustment of the control may be maintained by means of a retaining member.



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SHEET 1 OF 5

FIG.1

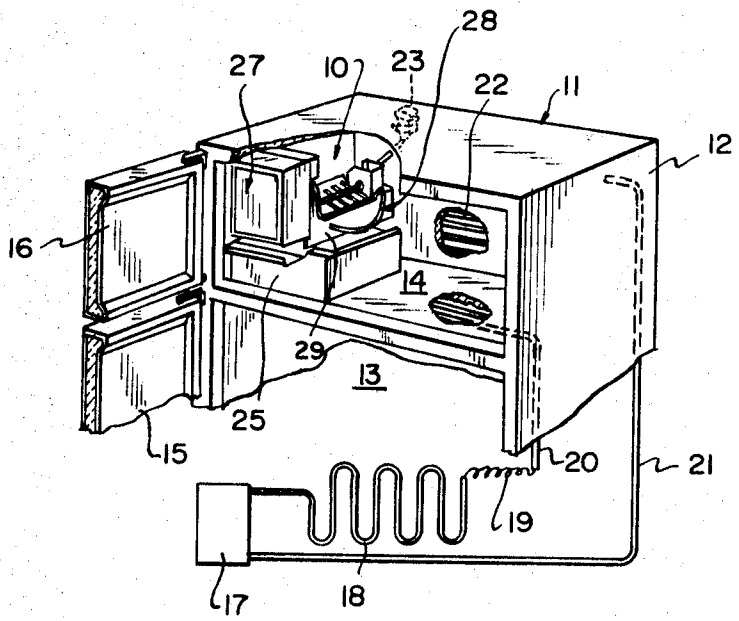
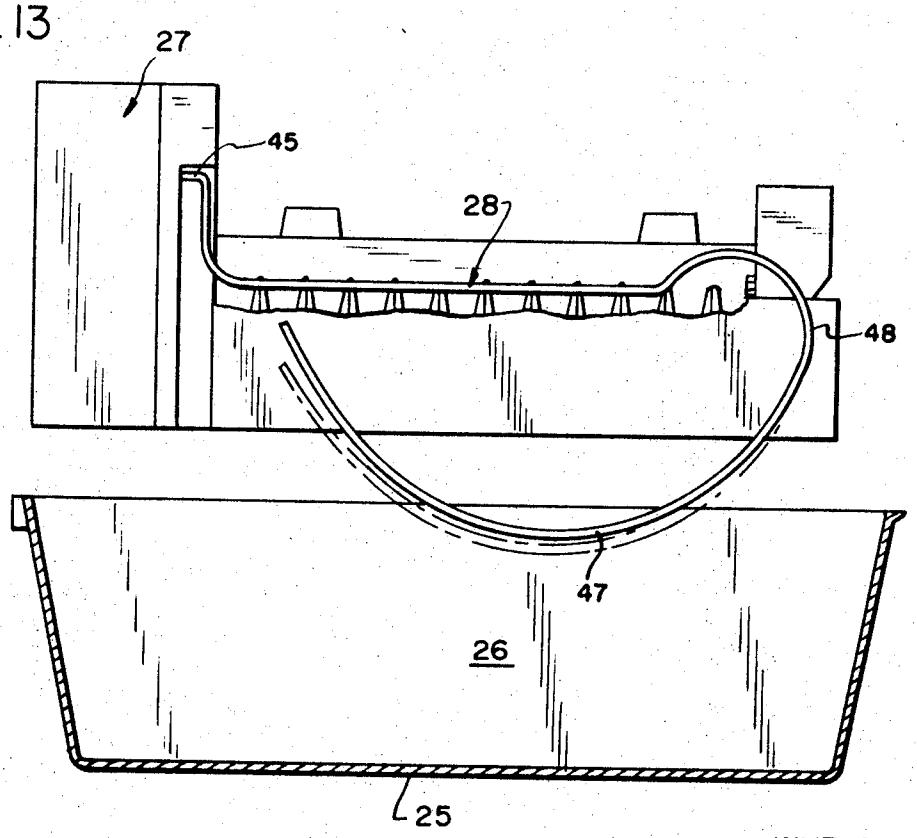


FIG. 13



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ATTORNEYS

FIG.2

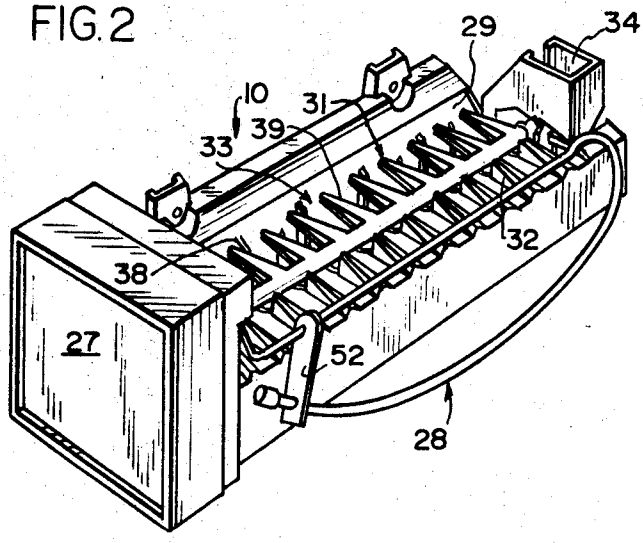


FIG.4

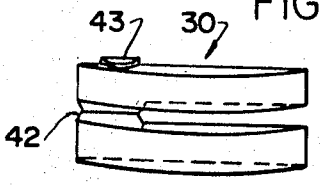


FIG.3

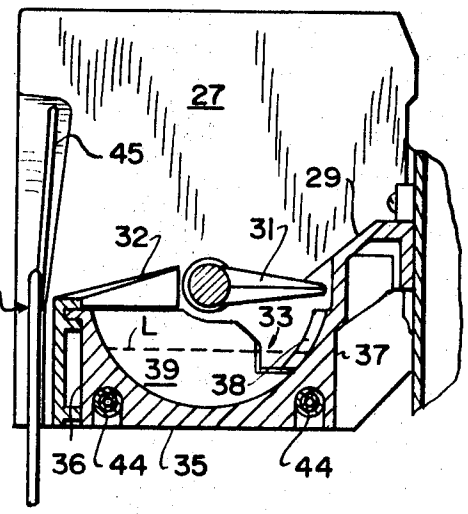


FIG.5

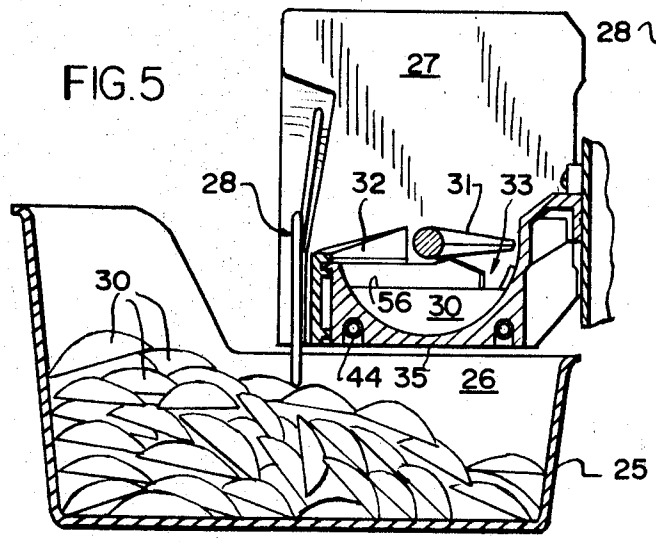


FIG.7

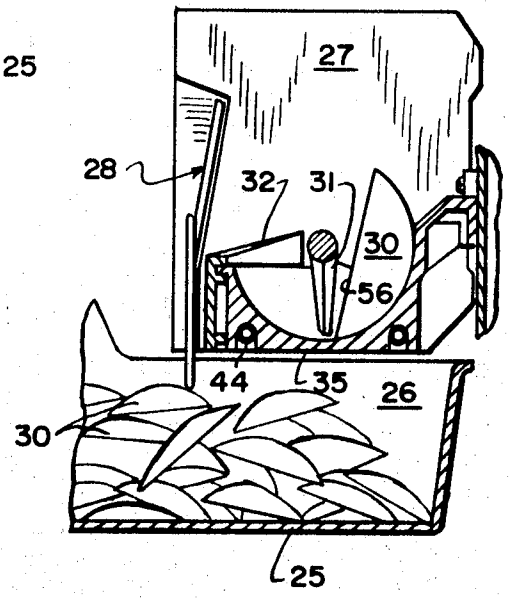


FIG.6

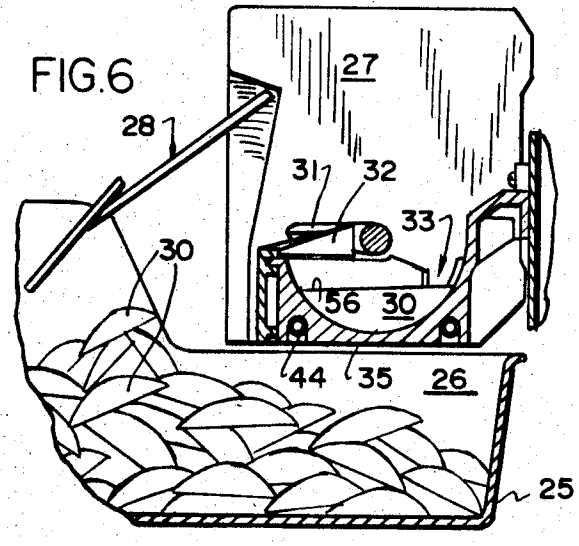


FIG.8

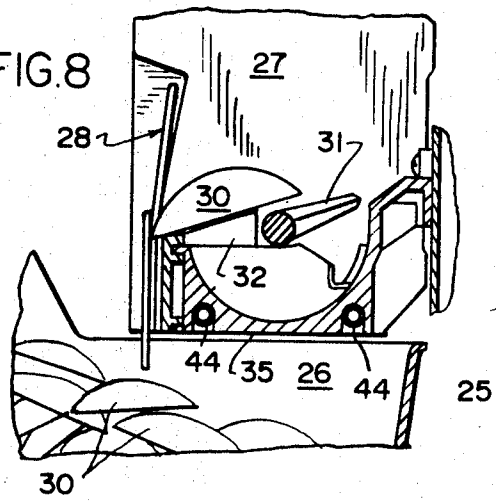


FIG.9

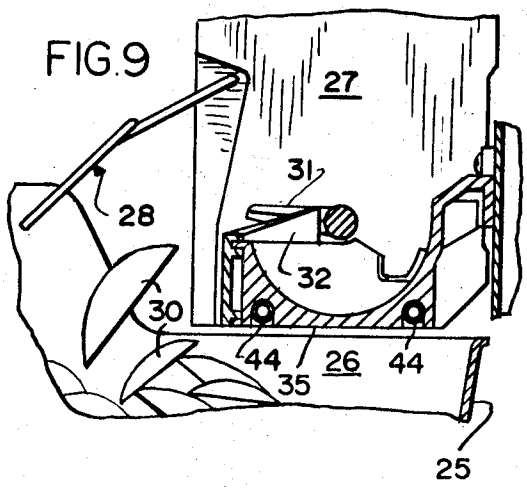
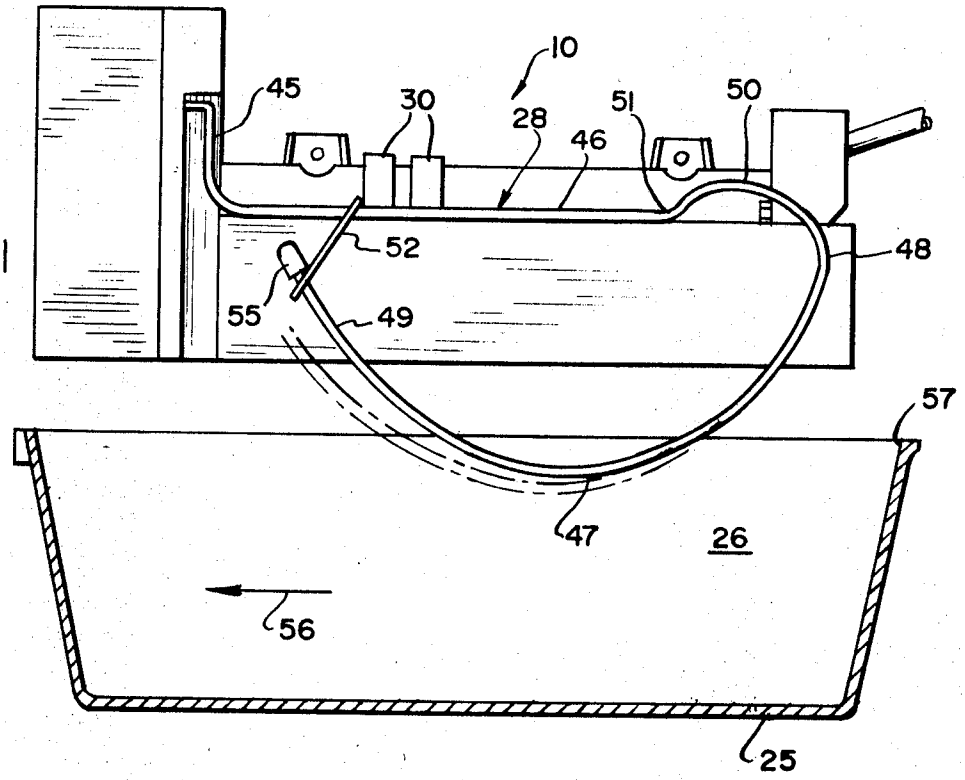


FIG.11



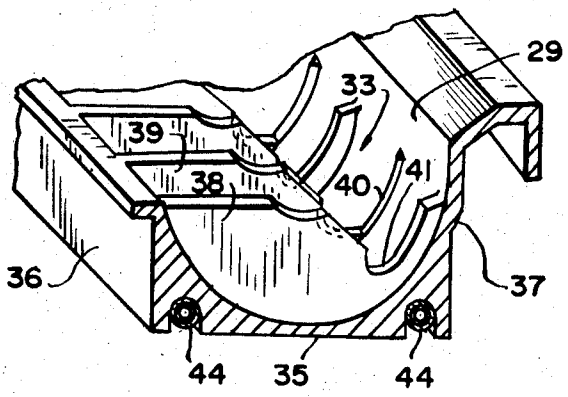


FIG.12

FIG. 14

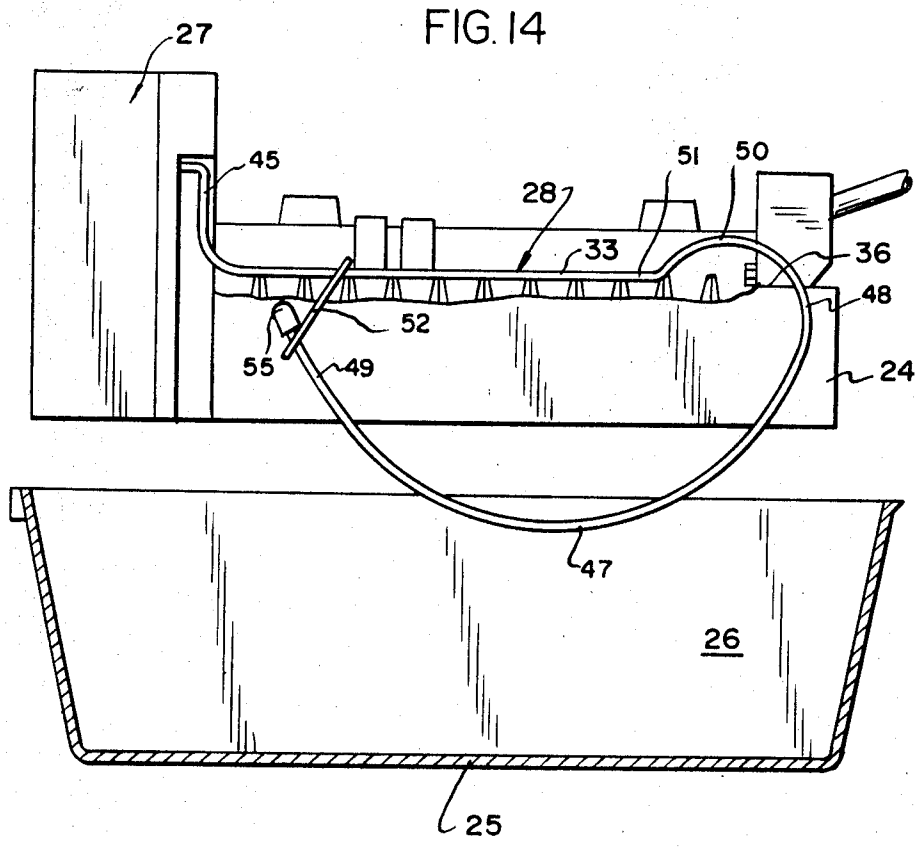


FIG. 15

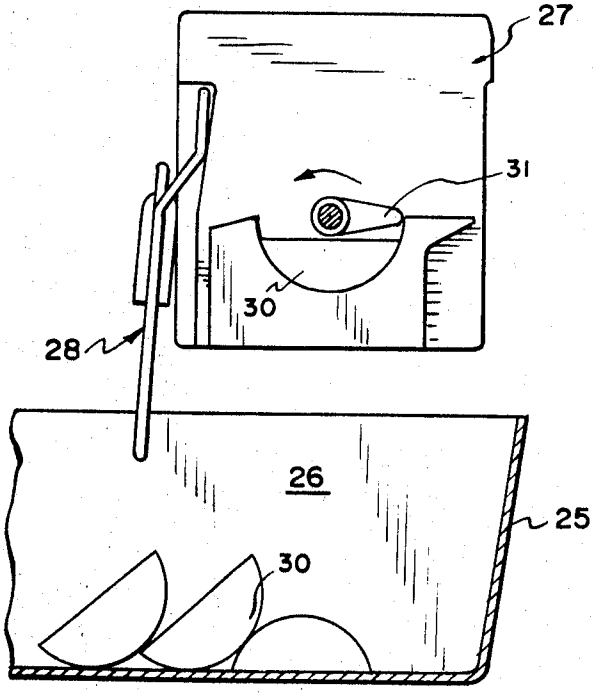


FIG. 10

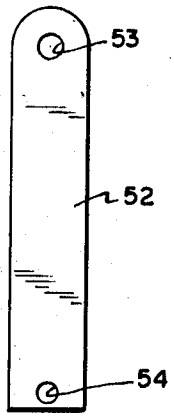


FIG. 16

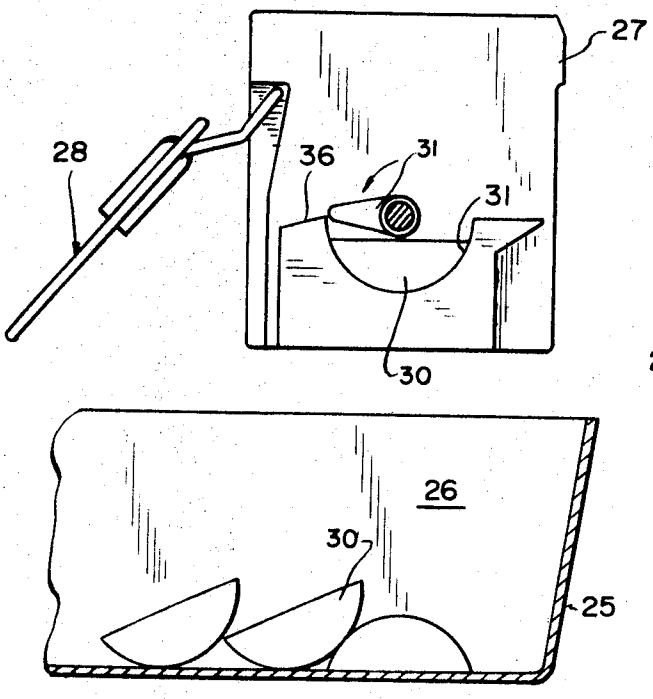


FIG. 17

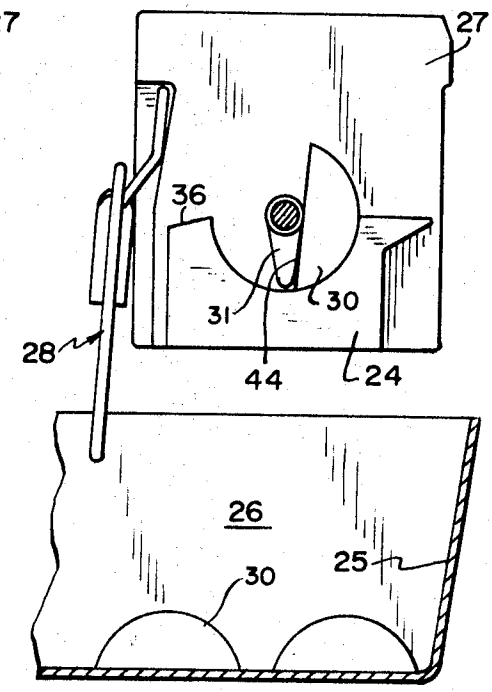


FIG. 18

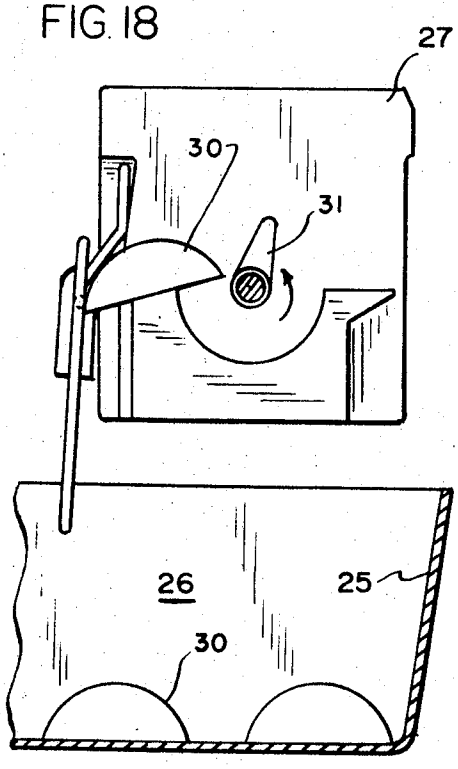
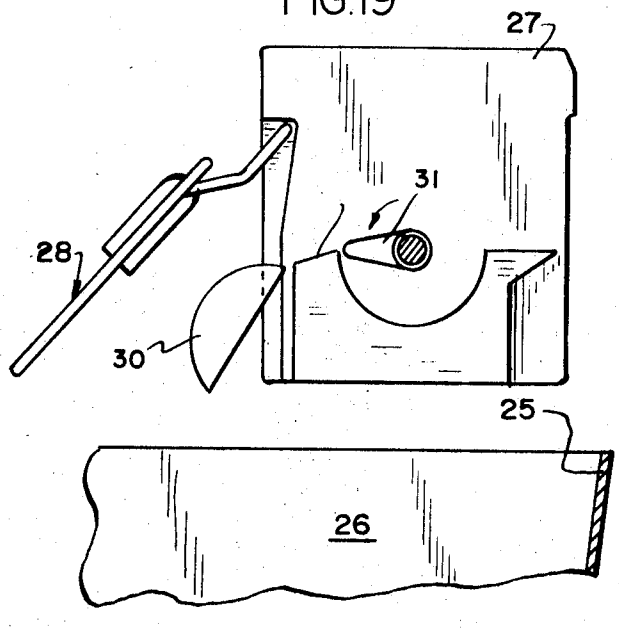


FIG. 19



ICE BODY MAKER COLLECTING BIN CONTROL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to ice body makers and in particular to controls for automatically controlling the operation thereof to maintain a preselected level of predryed ice bodies in a collecting bin associated therewith. The control further prevents accidental ejection of ice bodies from the bin upon subsequent removal thereof from the ice body maker.

2. Description of the Prior Art

In one form of improved ice body maker disclosed in Linstromberg U.S. Pat. No. 3,280,578, owned by the assignee of the instant invention, a mold is provided with an ejecting means for transferring the formed bodies to a subjacent collecting bin. In Heath U.S. Pat. No. 2,778,198, also owned by the assignee hereof, an ice-making machine is disclosed having a modified form of level-sensing means wherein intercepting members are operated by the control concurrently operating the sensing arm to hold the relatively wet ice bodies for a period of time before delivery thereof to the subjacent collecting bin.

SUMMARY OF THE INVENTION

The present invention comprehends an improved means for controlling the transfer of ice bodies in an ice body maker. In the structure disclosed herein, an elongate control element is provided having different portions providing a number of different coordinated functions whereby an improved control of the ice body transfer is obtained. Thus, in the present invention, the elongate control element includes a first portion selectively interrupting the transfer of the ice bodies from the mold to the collecting space whereby the ice bodies may be held to permit refreezing thereof after removal from the mold so that they will be substantially completely dry when they are delivered to the collecting space.

The control element further includes a sweep portion spaced from the holding portion by a connecting portion. The holding portion retains the ice bodies during the time the sweep portion moves through the collecting space to sense the level of ice bodies therein and thus prevents pileup of the ice bodies on the sweep portion during the sensing cycle. As a result of the improved holding function, the transferred ice bodies are prevented from being raked from the collecting space by the sweep portion should the bin, defining said collecting space, be subsequently removed from association with the ice body maker.

The present invention further comprehends providing such a control element with means for permitting selective adjustment so as to maintain different preselected levels of ice bodies in the collecting space, as desired by the user. The adjusting means is manually operable to permit facilitated adjustment and readjustment as desired. One highly desirable advantage of this feature is the adaptability of the control for use with different-size collecting bins. Such adjustability is also advantageous where the ice body maker is installed by the user in the field.

The improved control is extremely simple and economical of construction, while yet providing the desirable features discussed above.

More specifically, the invention comprehends an improved means for controlling the transfer of ice bodies in an ice body maker having a mold in which ice bodies are formed, means defining a collecting space subjacent the mold, and means for transferring the formed ice bodies along a preselected path from the mold to the collecting space. The transfer-controlling means is defined by an elongate control element having a holding portion, a sweep portion, and a connecting portion connecting the sweep portion to the holding portion. Operating means is provided for selectively disposing the holding portion in a first position blocking said preselected path for interrupting the transfer of the ice bodies, thereby maintaining the ice bodies spaced from the collecting space for a predetermined time period, and concurrently moving the sweep portion through the collecting space to sense the level of ice bodies already present in the collecting space. After the predetermined time, the operating means moves the holding portion from the first position to permit completion of the transfer of the ice bodies to the collecting space and disposes the sweep portion out of the path followed by the ice bodies during their transfer to the collecting bin.

Further, more specifically, the invention comprehends the provision of a deformable connecting portion permitting adjustment of the disposition of the sweep portion relative to the holding portion. The invention also comprehends provision of a retaining member for holding the sweep portion in the adjusted position relative to the holding portion whereby the sweep portion may be adjusted to sense any one of a plurality of different levels of collected ice bodies in the collecting space.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary perspective view of a refrigeration apparatus having an ice body maker embodying the invention, portions being broken away to facilitate illustration of the invention;

FIG. 2 is a perspective view of the ice body maker;

FIG. 3 is a traverse vertical section of the apparatus of FIG. 2;

FIG. 4 is a perspective view of an ice body as formed in the ice body maker illustrated in FIG. 2;

FIG. 5 is a traverse vertical section similar to FIG. 3 showing the ice body maker as at the initiation of an ejection cycle;

FIG. 6 is a diagrammatic section similar to that of FIG. 5 at a subsequent portion of the ejection cycle;

FIG. 7 is a diagrammatic section similar to that of FIG. 5 at a further subsequent portion of the ejection cycle with the ice bodies partially removed from the mold cavity;

FIG. 8 is a diagrammatic section similar to that of FIG. 5 at a further subsequent portion with the ice bodies transferred from the ejector to a resting shelf portion;

FIG. 9 is a diagrammatic section similar to that of FIG. 5 with the ice bodies being released from the resting shelf to fall into the collecting space;

FIG. 10 is an elevation of the connector element shown in FIG. 3 for holding the control in any one of a plurality of preselected adjusted positions; and

FIG. 11 is an enlarged side elevation of the ice body maker illustrating a modified form of the invention;

FIG. 12 is a fragmentary perspective view of the mold of the ice body maker;

FIG. 13 is an enlarged side elevation of the ice body maker with portions broken away to facilitate illustration of the invention;

FIG. 14 is a side elevation similar to that of FIG. 13 but showing the modified form of control means of FIG. 11;

FIG. 15 is a diagrammatic vertical section of the apparatus of FIG. 14 as at the initiation of an ejection cycle;

FIG. 16 is a diagrammatic section similar to that of FIG. 15 at a subsequent portion of the ejection cycle;

FIG. 17 is a diagrammatic section similar to that of FIG. 15 at a further subsequent portion of the ejection cycle with the ice body partially removed from the mold cavity;

FIG. 18 is a diagrammatic section similar to that of FIG. 15 at a further subsequent portion with the ice body transferred from the ejector to a resting shelf portion; and

FIG. 19 is a diagrammatic section similar to that of FIG. 15 with the ice bodies being released from the resting shelf to fall into the collecting space.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, an ice body maker generally designated **10** is shown to be installed in a refrigeration apparatus **11** of conventional construction. Apparatus **11** may include a cabinet **12** defining a refrigerator space **13** and a freezer space **14**. Controlled access to spaces **13** and **14** may be had by suitable doors **15** and **16** respectively. Refrigeration may be effected by suitable means, herein illustratively comprising a compressor **17**, a condenser **18**, a capillary **19** and conduits **20** and **21** for delivering refrigerant to and from an evaporator **22** provided within the cabinet **12**. Freezer space **14** is maintained at a below freezing temperature whereby water delivered to the ice body maker **10** through a conventional water solenoid **23** may be frozen into ice bodies which are automatically harvested.

The icemaker **10** as shown in FIG. **2** includes a mold **29** in which the ice bodies **30** (FIG. **4**) are formed and from which the ice bodies are ejected to a subjacent bin **25** defining a collecting space **26** (FIG. **1**) by means of an ejector **31** which sweeps through the mold during the ejection cycle. The ejection member swings the ice bodies out of mold **29** and against a stripper member **32** which effectively positively strips the ice bodies from the ejector **31** and causes them to fall downwardly into the collecting bin **25**. Cyclical operation of ejector **31** is automatically effected by a control generally indicated **27** disposed at the forward end of the mold **29**. In addition to cycling the ejector **31**, control **27** further automatically provides for refilling of the mold for subsequent further ice body formation therein, in the event that the level of ice bodies in the subjacent bin **25** is below a preselected full level. For a detailed description of the operation of control **27**, reference may be had to the hereinbefore identified Linstromberg U.S. Pat. No. 3,280,578. Mold **29** defines a plurality of upwardly opening cavities **33** in which ice bodies are formed. The water from which the ice bodies are formed is delivered to mold **29** by means of an inlet **34** connected to solenoid-operated valve **23** (FIG. **1**) through a suitable delivery tube. Valve **23** is connected to a suitable source of water under pressure (not shown).

Referring to FIGS. **2**, **3**, and **12**; mold **29** herein more specifically comprises a tray structure having a bottom wall **35** and sidewalls **36** and **37**. A calrod heating element **44** is pressed into bottom wall **35** to heat the mold during the ejection operation, thus aiding in said ejection operation. A plurality of partition walls **38** extend transversally across the mold to define with the above-indicated tray walls the cavities **33** in which ice bodies are formed. Herein each cavity **33** is partially divided by a partial dividing wall **39**, which extends transversally across the cavity as best seen in FIG. **12**. Each of the partition walls and dividing walls is provided with a recessed upper edge portion through which water flows from the end cavity successively forward to the respective cavities until all cavities are filled to a level L as shown in FIG. **3**. Thus, the recessed edge portion of respective partition and dividing walls over which the water flows effectively form a plurality of weirs over which a small body or bridge of connecting ice forms during the freezing operation. As shown in FIG. **12**, however, the recess **40** in the upper edge of the partial dividing wall **39** is substantially larger than the recess **41** in the partition wall **38**. Thus, the connecting portion of ice which forms in the space defined by recess **40** is substantially larger than the connecting length of ice which forms in the recess defined by opening **41**. Thus, a connecting ice portion **42** is formed on ice body **30** the protective shown in FIG. **4**. Connecting portion **42** is preferably sufficiently strong to prevent breaking of the ice body during the normal ejection and transfer thereof from mold cavity **33** to collecting bin **25**. Illustratively, the connecting portions **43** formed in the opening **41** of the mold shown in FIG. **12** may break as a result of the impact of the ice bodies resulting from their free fall into collecting bin **25** the connecting portions **42** being sufficiently strong to preclude breakage as from such impact forces. Thus, the mold as shown in FIG. **12** produces bifurcated ice bodies as shown in FIG. **4**.

In order to sense the level of ice bodies **30** as they accumulate in bin **25**, this invention comprehends the provision of a novel sensing arm structure **28** actuated by control **27** for controlling the automatic harvesting operation so as to maintain a preselected level of ice bodies in collecting space **26** as desired by the user. The control **27** operates the sensing arm **28** through a connecting portion **45**, as best seen in FIGS. **3** and **11**. The sensing arm **28** includes a holding portion **46**, a sweep portion **47**, and a connecting portion **48** which, as seen in FIG. **11**, effectively define a generally U-shaped structure wherein the holding portion **46**, and sweep portion **47** define the legs of the U-shaped structure and the connecting portion **48** defines the bight of the U-shaped structure.

As shown, holding portion **46** may be substantially rectilinear and extend adjacent the stripper **32** of the mold **29** onto which the ice bodies **30** are delivered during an intermediate stage of the ejection cycle. The sweep portion **47** is arcuate and the connection portion **48** is also arcuate. The arcuate configuration of connection portion **48** and sweep portion **47** effects an improvement over prior-art sensing arm structure as follows: Should the user of the icemaker remove bin **25** from the freezer compartment by sliding it in the direction indicated by arrow **56**, edge **57** of bin **25** contacts an arcuate portion of sensing arm **28**. This allows the arm to easily ride up over edge **57** and thus not catch thereon or rake ice bodies from bin **25**.

The sensing arm may be formed of a suitable strong material such as a metal rod or wire, and in the illustrated embodiment is formed of stainless steel having a spring temper. Further, illustratively, the sweep portion **47** may have a relatively large arcuate radius varying from approximately 3¾ inches adjacent the connecting portion **35** to approximately 4¾ inches adjacent the distal end **49** thereof. The connecting portion **48** may have an arcuate radius of approximately 1¼ inches and may include an upturned arcuate potion **50** extending from the distal end **51** of the holding portion **46**. As seen in FIG. **11**, the sweep portion **47** extends downwardly into the collecting space **26** while the distal end **49** is juxtaposed to the holding portion **46** adjacent the connection **45**.

As shown in FIG. **11**, the distal portion **49** may be adjustably spaced from the holding portion **46** by means of a connector strap **52** which connects end **49** to holding portion **46**. As shown in FIG. **10**, the connector strap **52** may comprise a plastic element having a pair of apertures **53** and **54** at the opposite ends thereof. Aperture **53** is preferably slightly larger than the cross section of the sensing arm **28** to permit facilitated movement of the strap **52** onto the holding portion **46** from the distal end **49** thereof. The distal end **49** is inserted into the smaller aperture **54** whereby the spacing of end **49** from the holding portion **46** may be retained by the canted locking engagement of the strap **52** with the respective rod portions **46** and **49**. A protective cap **55** may be installed on the end of the rod **28**.

The operation of sensing arm **28** with the ice body maker **10** may best be understood by reference to FIGS. **5**—**9** of the drawings. Thus, as shown in FIG. **5**, the ice-harvesting operation is initiated by counterclockwise rotation of the ejector **31** as seen herein, with the sensing arm **28** disposed in a lowermost level-sensing position within the bin space **26**. As ejector **31** continues to rotate, the sensing arm **28** is swung outwardly from the collecting bin **25**, as shown in FIG. **6**. Continued rotation of ejector **31** causes it to forcibly engage the upper surface **56** of the ice bodies and urge the ice bodies outwardly from the mold cavities **33** in a pivotal movement, as shown in FIG. **7**. At the same time, control **27** causes the sensing arm **28** to swing back downwardly into the collecting space **26**. At the position of FIG. **7** wherein the ejector fingers have moved approximately 270° from the start position, the control **27** brings the sensing arm substantially fully to the lowermost sensing position.

As shown in FIG. 8, the continued rotation of ejector 31 now brings the ice bodies 30 outwardly from the mold cavities 33 whereupon the ice bodies are stripped from ejector 31 by plastic stripper 32. Movement of ice bodies 30 into the subjacent collecting space 26 is blocked by the holding portion 46, and ice bodies 30 remain on top of stripper 32, as shown in FIGS. 8 and 11. Thus, the ice bodies are held on stripper 32 for a shot period of time while any melt formed thereon as a result of heating of the mold in the ejection cycle tends to refreeze whereby the ice bodies are dried before completion of their transfer from the mold to the collecting bin 25. Further, the holding portion 46 prevents the ice bodies from falling into the collecting space 26 prior to the movement outwardly of the sensing arm 28, as shown in FIG. 9, during the final portion of the harvesting operation. This effectively precludes the ice bodies 30 from piling up on sweep portion 47 during the ejection operation. Should such "piling up" be permitted, ice bodies 30 might be accidentally raked from bin 25 upon its removal from freezer compartment 14.

As shown in FIG. 9, the ejector 31 continues to rotate back to the starting position of FIG. 5 while the sensing arm 28 is again brought down into the collecting space 26 subsequent to the delivery of the ice bodies 30 thereinto to sense the new level of ice bodies in space 26. In the event that the level reaches the preselected level, the movement of the sweep portion 47 of the sensing arm 28 is arrested, thereby preventing further cycling of the ice body maker 10 until such time as the level is lowered as by the removal of ice bodies from the collecting bin whereupon the arm may move to the lowermost position to initiate a subsequent ice body making and harvesting operation.

To adjust the ice body maker to provide any one of a plurality of different levels of ice bodies in the collecting bin 25, the user may merely bend the connecting portion 48 to raise or lower the sweep portion 47 as desired (assuming that adjusting strap 52 is not used). Thus, as illustrated in FIG. 11, the connecting portion 48 may be bent to enlarge the radius thereof and lower the sweep portion 47 to the dotted line position providing a lower level of ice bodies in the collecting bin 25.

Alternatively, the adjusting strap 52 may be employed, as shown in FIG. 11, to retain the sweep portion 47 in any one of a plurality of different positions to obtain the desired adjustment of the level. The strap 52 may be suitably adjusted by movement of the distal end 49 of sweep portion 47 further into or outwardly of the aperture 54 with the adjusted positioning of the sweep portion 47 being retained by the frictional engagement of the strap with the sensing arm portions 46 and 47 in the respective apertures. Thus, not only does the strap 52 provide a means for adjustably connecting the distal end 49 of the arm 28 to the holding portion 46 to vary the disposition of the lowermost portion of the sweep portion 47, but it also stabilizes the sensing arm structure by effectively causing the sweep portion 47 to be connected to the upper portion of the sensing arm at each of the opposite ends thereof.

Where the adjustment of the disposition of sweep portion 47 is effected simply by suitably bending the connecting portion 48, the material of which sensing arm 28 is formed is preferably controlably deformable to permit the adjusted disposition to be maintained against the forces acting on the sensing arm in the normal sensing operations while yet the bending of the connecting portion 48 may be manually effected for facilitated adjustment by a user, such as a housewife. Where the connector strap 52 is utilized, the sensing arm material may be somewhat less rigid.

Thus, ice body maker 10 provides an improved control of the transfer of the ice bodies from the mold to the collecting space in the automatic harvesting operation. The control includes means for interrupting the transfer of the ice bodies sufficiently to assure a drying thereof before delivery to the collecting space and provides improved means for permitting variation in the preselected level of ice bodies in the collecting space, as desired by the user. The improved sensing arm further assures that the ice bodies will not pile up thereon during the ejection operation resulting in their accidental expulsion from the collecting bin should it be removed from the freezing compartment. The sensing arm structure is simple and economical of construction, while yet providing the above-discussed desirable features.

While we have shown and described certain embodiments of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed as defined as follows:

1. In an ice body maker having a mold in which ice bodies are formed, a collecting bin subjacent said mold, an ejector for ejecting formed ice bodies from said mold, and means for transferring said formed ice bodies along a preselected path from said mold to said collecting bin, means for controlling the transfer of said ice bodies and arresting the operation of said ice body maker when the level of ice bodies in said bin rises above a predetermined level comprising: an elongate control element having a holding portion, a sweep portion, and a connecting portion connecting said sweep portion fixedly to said holding portion; and means for selectively disposing said control element with said holding portion in a first position across said path to comprise a means for interrupting the transfer of said ice bodies and maintaining the ice bodies spaced from said collecting bin, and for moving said holding portion from said first position to permit completion of the transfer of said ice bodies to said collecting bin, said disposing means acting through said holding portion and said connecting portion to move said sweep portion through said collecting bin prior to the transfer to sense the level of ice bodies collected therein and to dispose said sweep portion out of said collecting bin during the transfer of said ice bodies to said collecting bin whereby accumulation of the ice bodies on said sweep portion during the transfer of said ice bodies is prevented.

2. The ice body maker controlling means of claim 1 wherein said element comprises a one piece, formed wire.

3. The ice body maker controlling means of claim 1 wherein said element comprises a U-shaped wire, said holding and sweep portions comprising the legs thereof and said connecting portion comprising the bight thereof.

4. The ice body maker controlling means of claim 1 wherein said connecting portion defines adjustable means for varying the disposition of said sweep portion relative to said holding portion whereby the predetermined level at which ice bodies are maintained in said bin may be selectively varied.

5. The ice body maker controlling means of claim 1 wherein said connecting portion is controlably manually bendable for varying the disposition of said sweep portion relative to said holding portion whereby the predetermined level at which ice bodies are maintained in said bin may be selectively varied.

6. The ice body maker controlling means of claim 1 wherein said holding portion is rectilinear.

7. The ice body maker controlling means of claim 1 wherein said sweep portion is arcuate.

8. The ice body maker controlling means of claim 1 wherein said connecting portion is arcuate.

9. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes means connecting said distal end to said holding portion.

10. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes means adjustably connecting said distal end to said holding portion to adjust the path of movement of said sweep portion through said collecting space thereby to sense any one of a plurality of different predetermined levels of ice bodies therein.

11. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes a connector element adjustably connecting said distal end to said holding portion.

12. The ice body maker controlling means of claim 11 wherein said connector element comprises a strap having a first portion retained on said holding portion and a second portion retained on said holding portion and a second portion retained on said sweep portion.

13. The ice body maker controlling means of claim 11 wherein said connector element comprises a strap having a first aperture receiving said holding portion and a second aperture receiving said sweep portion.

14. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes a flexible plastic member adjustably connecting said distal end to said holding portion.